



MILLENNIUM CHALLENGE ACCOUNT NEPAL (MCA-NEPAL)

Procurement of Plant Design, Supply, Delivery, Installation, Testing and Commissioning of New Butwal -Nepal/India Border 400kV D/C Transmission Line (18 km)

MCA-N/ETP/CB/006

ADDENDUM #4

Date of Issue: 30 April 2024

This Addendum No. 4 modifies respective portions of the Bidding Document issued on 15 March 2024 and amended through Addendum No. 1 on 8 April 2024 and Addendum No 2 and No 3 on 16 April 2024. The changes, as indicated below, are effective on the date of issue of this Addendum.

Except as expressly amended by this Addendum, all other terms and conditions of the Bidding Document - issued on 15 March 2024 and amended through Addendum No. 1 issued on 8 April 2024 and Addendum No 2 and No 3 on 16 April 2024 remains unchanged and shall remain in full force and effect in accordance with their terms.

General Line Characteristics

SN	Pages/Paragraph	Amendments
1.	Part 1, Section IV. Submission Forms, Price Schedule, BOQ for Schedule No. 1. Design Services, PDF Page 55 of 186	<p>Add a note at the end of BOQ for Schedule No. 1. Design Services as follows:</p> <p>Note: If the offered tower family is already type tested, the Contractor shall submit the proposed structure designs and prototype test report for review and approval by the Engineer. If the Engineer determines that the submittal is not acceptable, then the Contractor shall have to carry out the prototype testing of the tower as per Employer’s requirement. Irrespective of availability of earlier tower design and previous successful prototype testing, the Bidder is required to quote the cost of design and prototype testing of the Towers in the above Price Schedule for evaluation and comparison purpose. If during contract implementation the existing design and prototype testing report offered by the Contractor is accepted by the Engineer, then the associated cost submitted by the bidder as per the above price schedule will be deducted through variation.</p>

2. Part 1, Section IV. Submission Forms, Breakdown of Price for Price Reasonability, **BOQ for Schedule No. 1. Design Services, PDF Page 75 of 186**

Add a note at the end of **BOQ for Schedule No. 1. Design Services as follows:**

Note: If the offered tower family is already type tested, the Contractor shall submit the proposed structure designs and prototype test report for review and approval by the Engineer. If the Engineer determines that the submittal is not acceptable, then the Contractor shall have to carry out the prototype testing of the tower as per Employer’s requirement. Irrespective of availability of earlier tower design and previous successful prototype testing, the Bidder is required to quote the cost of design and prototype testing of the Towers in the above Breakdown of Price for Price Reasonability sheet for evaluation and comparison purpose. If during contract implementation the existing design and prototype testing report offered by the Contractor is accepted by the Engineer, then the associated cost submitted by the bidder as per the above Breakdown of Price for Price Reasonability will be deducted through variation.

3. Part 1, Section IV. Submission Forms, Form TECH-11: Technical Data Schedule 1. Technical Data Schedule, General Line Characteristics, Technical DATA Schedules – 400 kV Overhead Transmission Line General Characteristics, Page 99, 100 (PDF Page 143 and 144), 4.6

“

Item	Description	Unit	Required	Bidder Guaranteed
4.6	Minimum clearances between conductors/live fittings and tower steel structure 400 kV:			
	Under still air, phase to earth (lightning impulse)	m	3.15	
	Under medium wind: 586 Pa, -5°C, phase to earth (switching impulse)	m	2.85	
	Under high wind: 1103 Pa, 10°C, phase to earth (50 Hz power frequency)	m	1.0	

”

has been replaced by:

“

Item	Description	Unit	Required	Bidder Guaranteed
4.6	Minimum clearances between conductors/live fittings and			

”

		tower steel structure 400 kV:			
		Wind Pressure conditions		Minimum Electrical clearances	
		For single suspension insulator strings			
		0 degree swing	mm	3150	
		22 degree swing	mm	3050	
		44 degree swing	mm	1860	
		For jumpers in tension insulator strings			
		0 degree swing	mm	3150	
		25 degree swing	mm	3050	
		40 degree swing	mm	1860	
		For pilot insulator strings			
		0 degree swing	mm	3150	
		15 degree swing	mm	3050	
		”			
4.	Part 2 – Employer’s Requirement, Section V - B1, 5.4.1.6 Air Density Factor, Page 16 (PDF Page 17)	<p>“Bidders shall take into account the reduction of air density with altitude in order to reduce the dynamic air pressure acting on conductors, wires and tower structures. By segmenting appropriately, the longitudinal profile of the line routing through the use of customized Weather Loads, Criteria files, etc. within PLS-CADD line model, the Bidders can customize the applicable loading conditions, as long as the same Reference Design wind speeds are used over the entire line length.”</p> <p>has been replaced by:</p> <p>“Air Density correction factor shall not be considered.”</p>			

<p>5.</p>	<p>Part 2 – Employer’s Requirement, Section V - B1, 5.4.1.7 Span Factor, Page 17 (PDF Page 18)</p>	<p>“Contractors shall also consider the use of IEC 60826 Span Factor GL (or its equivalent GC Factor, built within IS-802, 2015, where it combines height and span effects) to optimize the design. There are many examples from the preliminary design that illustrate how the use of the span factor can contribute to optimize line design.”</p> <p>has been replaced by:</p> <p>“Span Factor is not required to be considered.”</p>
<p>6.</p>	<p>Part 2 – Employer’s Requirement, Section V - B1, 5.6 STRUCTURES, 5.6.1 Design Parameters, point h, Page 29 (PDF Page 30 of 47)</p>	<p>“The towers must be tested in accordance with <i>IEC 60652: Loading Tests on Overhead Line Structures, as well as guidelines from ASCE 10-15: Design of Latticed Steel Transmission Structures and subjected to the loads as derived from the structure spotting, Design Criteria, IS 802, and IEC 60826</i>. The proposed structure types, Design Criteria and test program must be submitted to the Engineer. Full scale testing of tower for Suspension Type (D1A) and Tension Tower (D1E) with highest body extension of maximum overturning moment, maximum uplift in maximum loading condition to be done.”</p> <p>has been replaced by:</p> <p>“The towers must be tested in accordance with <i>IEC 60652: Loading Tests on Overhead Line Structures, as well as guidelines from ASCE 10-15: Design of Latticed Steel Transmission Structures and subjected to the loads as derived from the structure spotting, Design Criteria, IS 802, and IEC 60826</i>. The proposed structure types, Design Criteria and test program must be submitted to the Engineer. Full scale testing of tower for Suspension Type (D1A) and Tension Tower (D1E) with highest body extension of maximum overturning moment, maximum uplift in maximum loading condition to be done.</p> <p>If the offered tower family is already type tested, the Contractor shall submit the proposed structure designs and prototype test report for review and approval by the Engineer. If the Engineer determines that the submittal is not acceptable, then the Contractor shall have to carry out the prototype testing of the tower as per Employer’s requirement. Irrespective of availability of earlier tower design and previous successful prototype testing, the Bidder is required to quote the cost of design and prototype testing of the Towers in the Price Schedule for evaluation and comparison purpose. If during contract implementation the existing design and prototype testing report offered by the Contractor is accepted by the Engineer, then the associated cost submitted by the bidder as per the price schedule will be deducted through variation.”</p>



7.	<p>Part 2 – Employer’s Requirement, Section V - B1, 5.4.2 DETAILED REQUIREMENTS & SPECIFICATIONS, 5.4.2.1 Loading Conditions for Tower Structures, Table B1-1 Design Loading Conditions for Tower Structures, Page 19 (PDF Page 29), foot note 3</p>	<p>“These Design Wind Pressures and Wind Speeds are Reference dynamic wind pressures (and 10-minutes reference design wind speeds) considered at 10 meters above ground, for Terrain Category 2 of IS-802. For the effective design wind pressures acting on towers, insulators, conductors and shield wires, consideration of proper adjustment factors for span length and effective height above ground shall be taken into account. For wind on cables, further adjustment through air density factor may also be made by Contractor provided the selected factor is valid at the effective height of each relevant cable in each individual span, in a series of consecutive spans making a segmented portion of the transmission line of the length considered to be appropriate by the Contractor. Not a single violation of theoretical minimum air density will be tolerated within any line segment. For individual towers, the air density (factor) may also be adjusted provided taken constant over entire tower height. IEC-60826 Tables shall be used for Air Density factor, and Tables from IS-802 shall be those used for other situations (combined span and height factor Gc for cables, height factors GT and Gi for tower and insulators, drag factor Cdt on tower, etc..)”</p> <p>has been replaced by:</p> <p>“These Design Wind Pressures and Wind Speeds are Reference dynamic wind pressures (and 10-minutes reference design wind speeds) considered at 10 meters above ground, for Terrain Category 2 of IS-802-2015.”.</p>
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8.	<p>Part 2 – Employer’s Requirement, Section V - B1, 5.9.2 Clearance to Structure/Insulator Swing, Page 40 (PDF Page 41 of 47), the table</p>	<table border="1"> <thead> <tr> <th data-bbox="537 1115 1219 1245">Wind Pressure conditions</th> <th data-bbox="1219 1115 1479 1245">Minimum Electrical clearances</th> </tr> </thead> <tbody> <tr> <td data-bbox="537 1245 1219 1297">A. For single suspension insulator strings</td> <td data-bbox="1219 1245 1479 1297"></td> </tr> <tr> <td data-bbox="537 1297 1219 1352">1. 0 degree swing</td> <td data-bbox="1219 1297 1479 1352">3050 mm</td> </tr> <tr> <td data-bbox="537 1352 1219 1407">2. 22 degree swing</td> <td data-bbox="1219 1352 1479 1407">3050 mm</td> </tr> <tr> <td data-bbox="537 1407 1219 1461">3. 44 degree swing</td> <td data-bbox="1219 1407 1479 1461">1860 mm</td> </tr> <tr> <td data-bbox="537 1461 1219 1516">B. For jumpers in tension insulator strings</td> <td data-bbox="1219 1461 1479 1516"></td> </tr> <tr> <td data-bbox="537 1516 1219 1570">1. 0 degree swing</td> <td data-bbox="1219 1516 1479 1570"></td> </tr> <tr> <td data-bbox="537 1570 1219 1625">2. 25 degree swing</td> <td data-bbox="1219 1570 1479 1625">3050 mm</td> </tr> <tr> <td data-bbox="537 1625 1219 1680">4. 40 degree swing</td> <td data-bbox="1219 1625 1479 1680">1860 mm</td> </tr> <tr> <td data-bbox="537 1680 1219 1734">C. For insulator strings</td> <td data-bbox="1219 1680 1479 1734"></td> </tr> <tr> <td data-bbox="537 1734 1219 1789">1. 0 degree swing</td> <td data-bbox="1219 1734 1479 1789"></td> </tr> <tr> <td data-bbox="537 1789 1219 1871">2. 15 degree swing</td> <td data-bbox="1219 1789 1479 1871">3050 mm</td> </tr> </tbody> </table>	Wind Pressure conditions	Minimum Electrical clearances	A. For single suspension insulator strings		1. 0 degree swing	3050 mm	2. 22 degree swing	3050 mm	3. 44 degree swing	1860 mm	B. For jumpers in tension insulator strings		1. 0 degree swing		2. 25 degree swing	3050 mm	4. 40 degree swing	1860 mm	C. For insulator strings		1. 0 degree swing		2. 15 degree swing	3050 mm
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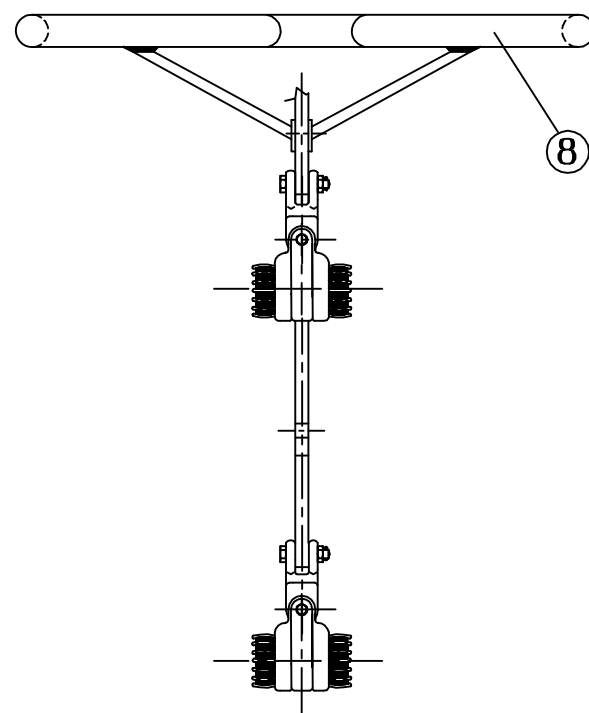
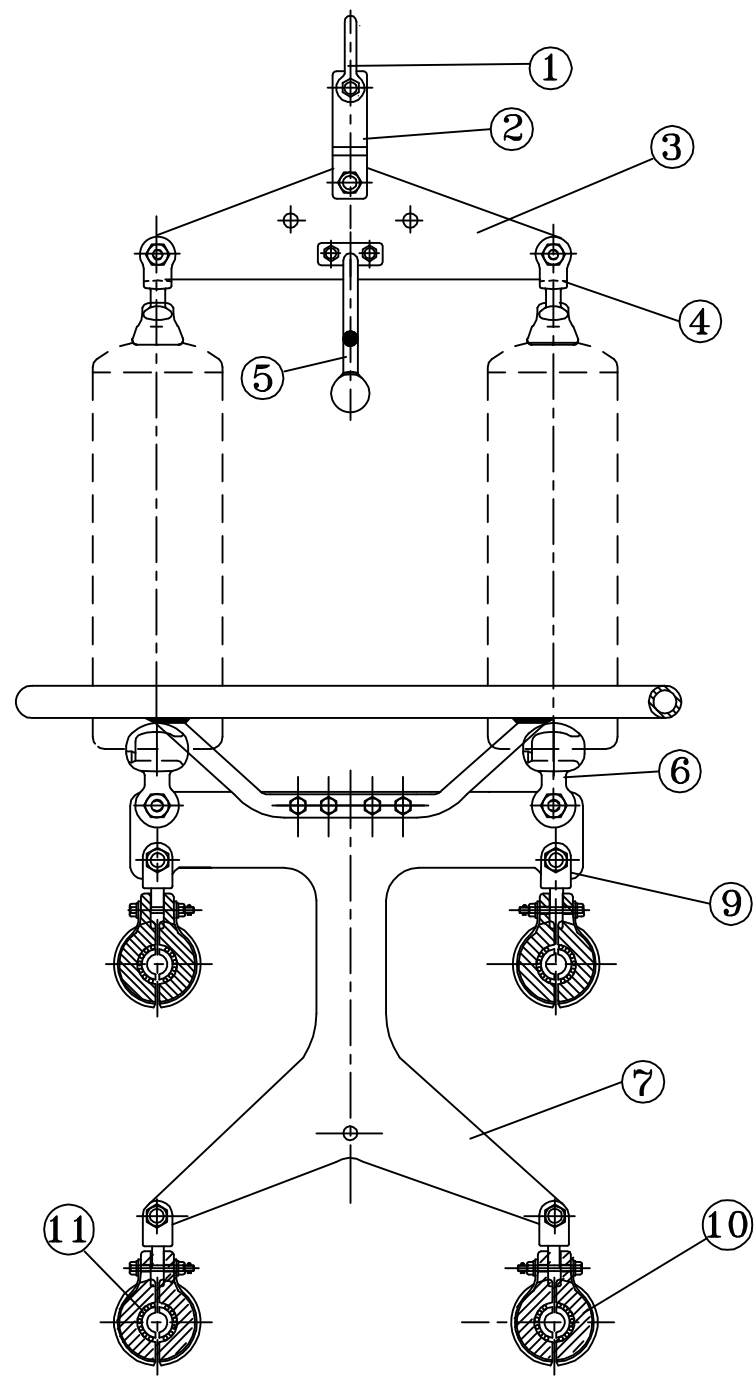
		<p>has been replaced by:</p> <table border="1" data-bbox="618 405 1398 1136"> <thead> <tr> <th data-bbox="618 405 1227 531">Wind Pressure conditions</th> <th data-bbox="1227 405 1398 531">Minimum Electrical clearances</th> </tr> </thead> <tbody> <tr> <td data-bbox="618 531 1227 583">A. For single suspension insulator strings</td> <td data-bbox="1227 531 1398 583"></td> </tr> <tr> <td data-bbox="618 583 1227 636">1. 0 degree swing</td> <td data-bbox="1227 583 1398 636">3050 mm</td> </tr> <tr> <td data-bbox="618 636 1227 688">2. 22 degree swing</td> <td data-bbox="1227 636 1398 688">3050 mm</td> </tr> <tr> <td data-bbox="618 688 1227 741">3. 44 degree swing</td> <td data-bbox="1227 688 1398 741">1860 mm</td> </tr> <tr> <td data-bbox="618 741 1227 793">B. For jumpers in tension insulator strings</td> <td data-bbox="1227 741 1398 793"></td> </tr> <tr> <td data-bbox="618 793 1227 846">1. 0 degree swing</td> <td data-bbox="1227 793 1398 846">3050 mm</td> </tr> <tr> <td data-bbox="618 846 1227 898">2. 25 degree swing</td> <td data-bbox="1227 846 1398 898">3050 mm</td> </tr> <tr> <td data-bbox="618 898 1227 951">3. 40 degree swing</td> <td data-bbox="1227 898 1398 951">1860 mm</td> </tr> <tr> <td data-bbox="618 951 1227 1003">For pilot insulator strings</td> <td data-bbox="1227 951 1398 1003"></td> </tr> <tr> <td data-bbox="618 1003 1227 1056">1. 0 degree swing</td> <td data-bbox="1227 1003 1398 1056">3050 mm</td> </tr> <tr> <td data-bbox="618 1056 1227 1136">2. 15 degree swing</td> <td data-bbox="1227 1056 1398 1136">3050 mm</td> </tr> </tbody> </table>	Wind Pressure conditions	Minimum Electrical clearances	A. For single suspension insulator strings		1. 0 degree swing	3050 mm	2. 22 degree swing	3050 mm	3. 44 degree swing	1860 mm	B. For jumpers in tension insulator strings		1. 0 degree swing	3050 mm	2. 25 degree swing	3050 mm	3. 40 degree swing	1860 mm	For pilot insulator strings		1. 0 degree swing	3050 mm	2. 15 degree swing	3050 mm
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9.	Part 2 – Employer’s Requirement, Section V - B1, 5.9.4 Clearance to Structure/Insulator Swing, Page 41 (PDF Page 42 of 47)	5.9.4 Clearance to Structure/Insulator Swing is deleted.																								
10.	Part 2 – Employer’s Requirement, Section V - B1, Annex_B1, 4. Annex G_PLS_CADD Files_Final Design Report	<p>The old files “IB-NB_PLSCADD Backupfile_12062023-002.bak” and “new Butwal to India border_v1-001.bak” are deleted from the provided link and replaced by :</p> <p>“new butwal to india border_v1 rev02_06 Mar.bak”</p>																								

11.	Part 2 - Employer's Requirements Section V - B1 Annex D Appen- dix 8 - Insulator Specification_ Hardware Specifi- cation	Additional Document named "Tender Level Document for Hardware and Fitting for Insulator" provided as Annex A to this Addendum #4.
12.	Part 2 - Employer's Requirements Section V - B1, Annex_B1, 5. Annex C_Structure List_Final Design Report	Add file named "Plan and Profile for 18km Transmission Line" as Annex B of this Addendum #4

Annexes

Sr. No.	Name of the Document	Document
A	Tender Level Document for Hardware and Fitting for Insulator1	 240417_Hardware_Fittings.pdf
B	Plan and Profile for 18km Transmission Line	 Plan_Profile_of_18km_400kV_TL_MCA-Nep

A Tender Level Document for Hardware and Fitting for Insulator1



TECHNICAL DETAILS:

- 1) ALL DIMENSIONS ARE IN MILLIMETER.
- 2) SLIPPING STRENGTH OF CLAMP BETWEEN 20 TO 29 kN.
- 3) BALL & SOCKET SIZE 20 mm AS PER IS:2486 (PART-II).
- 4) ALL FERROUS PARTS ARE HOT DIP GALVANISED & SPRING WASHER ELECTRO GALVANISED AS PER POWERGRID SPECIFICATION.
- 5) MIN.CORONA EXTINCTION VOLTAGE (DRY) 320 KV (RMS).
- 6) RIV AT 305 KV R.M.S. (DRY) BELOW 1000 MICROVOLTS.
- 7) HARDWARE TOLERANCES ON LENGTH $\pm 2\%$.
- 8) GENERAL TOLERANCE $\pm 3\%$ UNLESS OTHER WISE SPECIFIED.
- 9) MIN UTS OF STRING WITHOUT SUSPENSION CLAMP : 240 kN
- 10) TOTAL MASS OF ASSEMBLY : 85 kg (APPROX)
- 11) EACH COMPONENT SHALL BE LEGIBLY AND INDELIBLY MARKED WITH TRADE MARK OF THE MANUFACTURER – "EMI" EXCLUDING SMALL SUBCOMPONENTS VIZ. SPRING WASHERS , SECURITY CLIPS ETC
- 12) The drawing is indicative and for the tender purpose only.

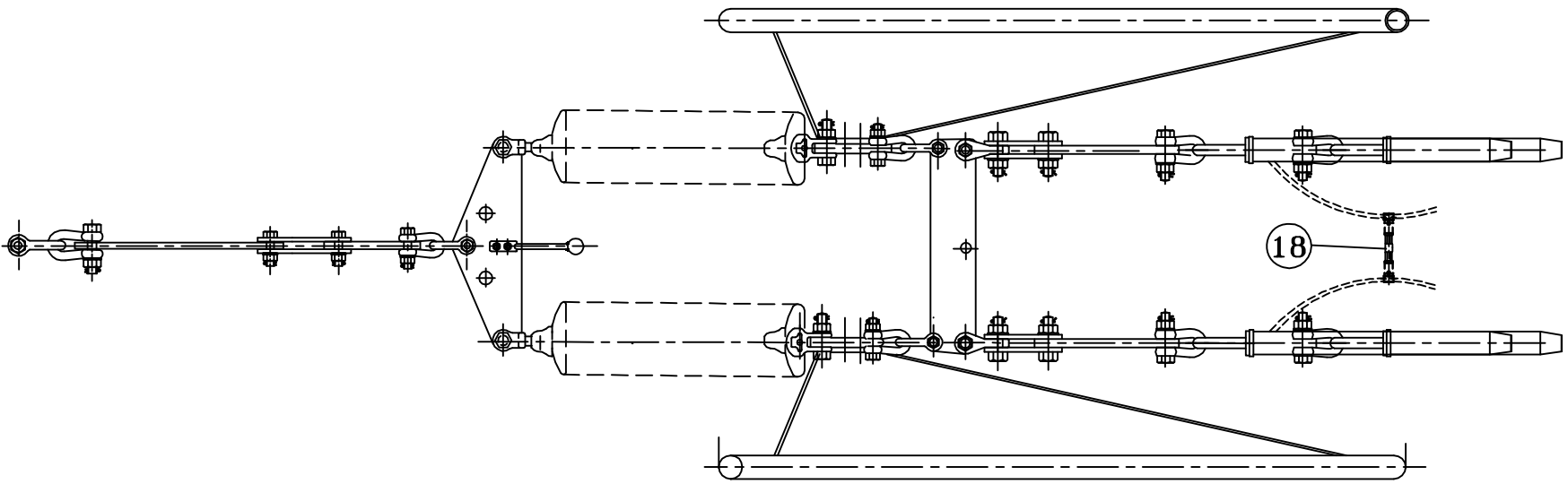
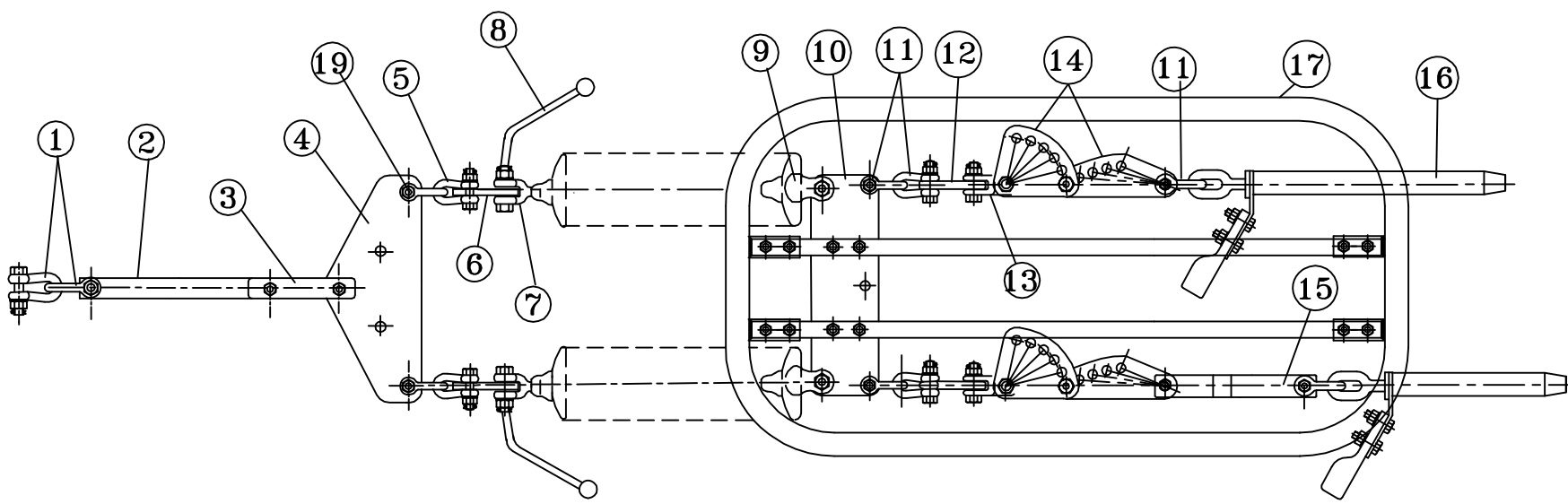
COMPONENT DETAILS

No.	DESCRIPTION	MATERIAL	U.T.S.	WEIGHT	QTY.	FINISH	COMPONENT NO.
11	ARMOUR ROD	HIGH TENSILE ALUMINIUM ROD 65032/6061,IS:733	343 N/mm ²	5.200 KG	4 Sets	----	DS : AGSC
10	SUSPENSION CLAMP	ALUMINIUM ALLOY 4600, IS:617	70 KN	3.100 KG	4	----	
9	CLEVIS EYE	FORGED STEEL CL-IV, IS:2004	70 KN	0.800 KG	4	H. D. G.	DS : CE
8	GRADING RING	ALUMINIUM ALLOY 63400/6063, IS:733	1.5 KN	5.750 KG	1	----	DS : GR
7	YOKE PLATE	MILD STEEL Fe-410, IS:2062	240 KN	17.5 KG	1	H. D. G.	DS : YPL
6	SOCKET CLEVIS	FORGED STEEL CL-IV, IS:2004	120 KN	1.350 KG	2	H. D. G.	DS : SC
5	ARCING HORN	MILD STEEL Fe-410, IS:2062	1.5 KN	3.600 KG	2	H. D. G.	DS : AH
4	BALL CLEVIS	FORGED STEEL CL-IV, IS:2004	120 KN	1.150 KG	2	H. D. G.	DS : BC
3	YOKE PLATE	MILD STEEL Fe-410, IS:2062	240 KN	8.350 KG	1	H. D. G.	DS : YPT
2	Y-STRAP	MILD STEEL Fe-410, IS:2062	240 KN	3.200 KG	1	H. D. G.	DS : YS
1	ANCHOR SHACKLE	FORGED STEEL CL-IV, IS:2004	240 KN	1.600 KG	1	H. D. G.	DS : AS

400 KV DOUBLE I SUSPENSION
STRING FOR QUADRUPLE ACSR
MOOSE CONDUCTOR

TECHNICAL DETAILS:

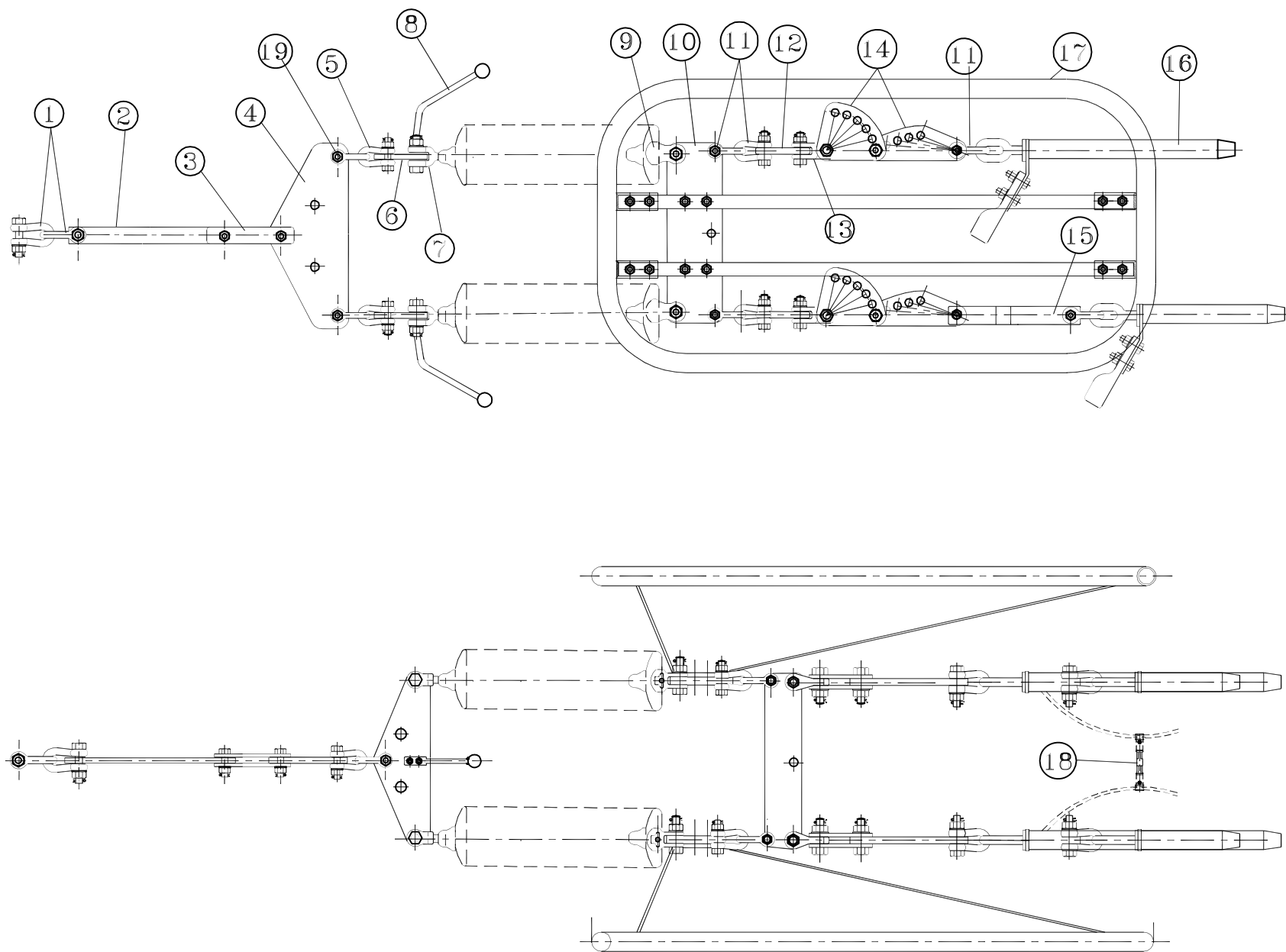
- 1) ALL DIMENSIONS ARE IN MILLIMETER.
- 2) SLIPPING STRENGTH OF DEAD END ASSEMBLY : 154 kN (Min.).
- 3) BALL & SOCKET SIZE : 20 mm AS PER IS : 2486 (PART-II).
- 4) ALL FERROUS PARTS HOT DIP GALVANIZED & SPRING WASHER ELECTRO GALVANISED AS PER POWERGRID SPECIFICATION
- 5) MIN.CORONA EXTINCTION VOLTAGE (DRY) 320 kV (RMS).
- 6) RIV AT 305 KV RMS (DRY) BELOW 1000 MICROVOLTS.
- 7) HARDWARE TOLERANCES ON LENGTH $\pm 2\%$.
- 8) GENERAL TOLERANCE $\pm 3\%$ UNLESS OTHER WISE SPECIFIED.
- 9) SECURITY CLIP : STAINLESS STEEL
- 10) MIN UTS OF STRING WITHOUT TENSION CLAMP : 640 kN.
- 11) TOTAL MASS OF THE ASSEMBLY : 261.72 kg (APPROX)
- 12) EACH COMPONENT SHALL BE LEGIBLY & INDELIBLY MARKED WITH TRADE MARK OF THE MANUFACTURER - " EMI " EXCLUDING SMALL SUBCOMPONENTS VIZ. SPRING WASHERS , SECURITY CLIPS ETC .
- 13) The drawing is indicative and for the tender purpose only.



COMPONENT DETAILS

19	ANCHOR SHACKLE	FORGED STEEL CL-IV, IS:2004	320 KN.	2.370 KG	2	H. D. G.	QT : AS3
18	SPACER (250 mm)	ALUMINIUM ALLOY 4600,IS:733	----	1.100 KG	1	----	QT : RSP
17	CORONA CONTROL RING	ALUMINIUM ALLOY 63400/6063 IS:733	1.5 KN	15.800 KG	2,SET	----	QT : CCR
16	COMPRESSION DEADEND	ALUMINIUM ALLOY 63400/6063 IS:733	153.2 KN(min)	6.500 KG	4	----	QT : DE
15	Y-TYPE STRAP	MILD STEEL Fe-410 IS:2062	160 KN	3.600 KG	2	H. D. G.	QT : YS
14	SAG ADJUSTING PLATE	MILD STEEL Fe-410 IS:2062	160 KN	6.900 KG	4	H. D. G.	QT : SAP
13	CLEVIS EYE	FORGED STEEL CL-IV, IS:2004	160 KN	1.250 KG	4	H. D. G.	QT : CE
12	YOKE PLATE	MILD STEEL Fe-410 IS:2062	320 KN.	9.800 KG	2	H. D. G.	QT :YPL1
11	ANCHOR SHACKLE	FORGED STEEL CL-IV, IS:2004	160 KN.	1.250 KG	12	H. D. G.	QT : AS2
10	YOKE PLATE	MILD STEEL Fe-410 IS:2062	320 KN.	9.700 KG	2	H. D. G.	QT : YPL
9	SOCKET CLEVIS	FORGED STEEL CL-IV, IS:2004	160 KN	1.500 KG	4	H. D. G.	QT : SC
8	ARCING HORN	MILD STEEL Fe-410 IS:2062	1.5 KN	2.670 KG	2	H. D. G.	QT : AH
7	BALL CLEVIS	FORGED STEEL CL-IV, IS:2004	160 KN	1.150 KG	4	H. D. G.	QT : BC
6	YOKE PLATE	MILD STEEL Fe-410 IS:2062	320 KN.	10.300 KG	2	H. D. G.	QT : YPT1
5	ANCHOR SHACKLE	FORGED STEEL CL-IV, IS:2004	320 KN.	2.370 KG	2	H. D. G.	QT : AS1
4	YOKE PLATE	MILD STEEL Fe-410 IS:2062	640 KN.	21.300 KG	1	H. D. G.	QT : YPT
3	STRAP	MILD STEEL Fe-410 IS:2062	640 KN.	15.500 KG	1,SET	H. D. G.	QT : SP
2	EXTENSION LINK	MILD STEEL Fe-410 IS:2062	640 KN.	13 KG	1	H. D. G.	QT : EL
1	ANCHOR SHACKLE	FORGED STEEL CL-IV, IS:2004	640 KN.	7 KG	2	H. D. G.	QT : AS
Sr.No.	DESCRIPTION	MATERIAL	U.T.S.	WEIGHT	QTY.	FINISH	COMPONENT NO.

400 KV, QUADRUPLE TENSION STRING
SUITABLE FOR QUADRUPLE ACSR
MOOSE CONDUCTOR



TECHNICAL DETAILS:

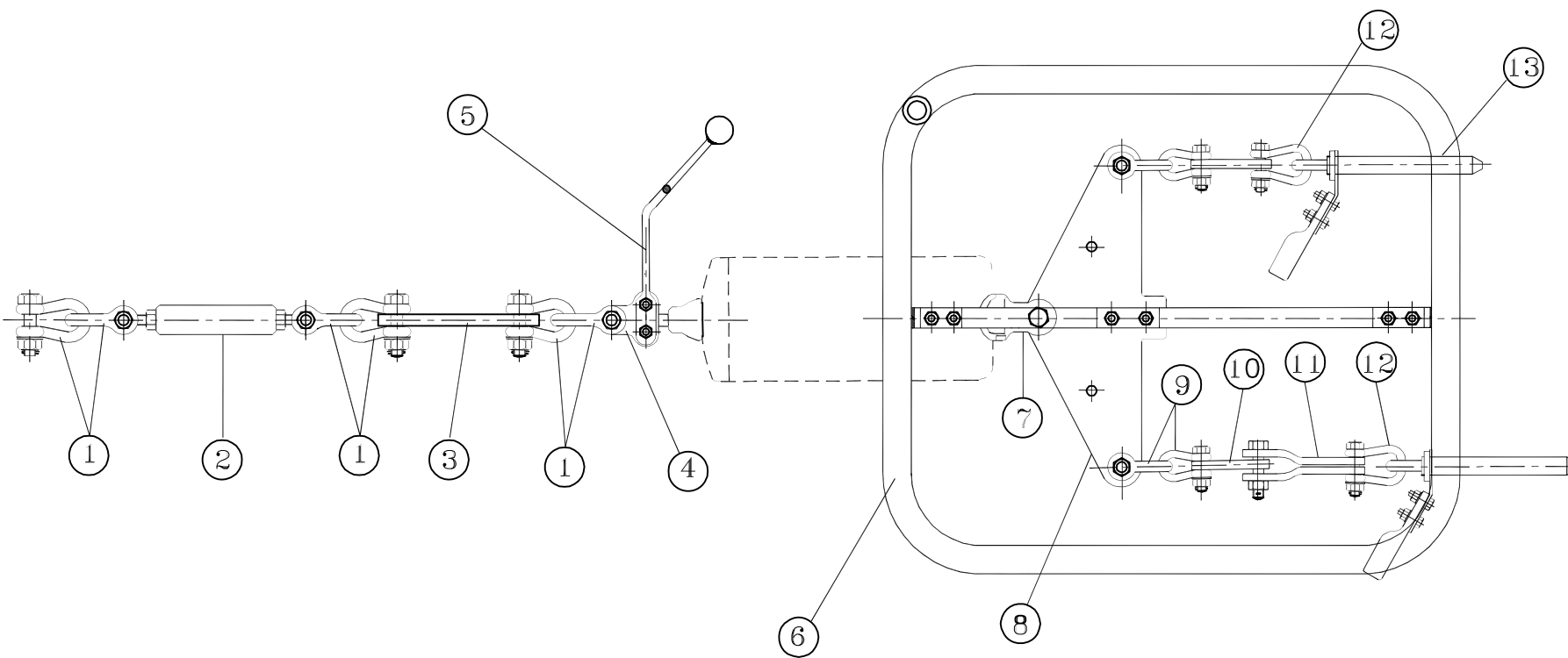
- 1) ALL DIMENSIONS ARE IN MILLIMETER.
- 2) SLIPPING STRENGTH OF DEAD END ASSEMBLY : 154 kN (Min.).
- 3) BALL & SOCKET SIZE : 20 mm AS PER IS : 2486 (PART-II).
- 4) ALL FERROUS PARTS HOT DIP GALVANIZED & SPRING WASHER ELECTRO GALVANISED AS PER POWERGRID SPECIFICATION
- 5) MIN. CORONA EXTINCTION VOLTAGE (DRY) 320 kV (RMS).
- 6) RIV AT 305 KV RMS (DRY) BELOW 1000 MICROVOLTS.
- 7) HARDWARE TOLERANCES ON LENGTH $\pm 2\%$.
- 8) GENERAL TOLERANCE $\pm 3\%$ UNLESS OTHER WISE SPECIFIED.
- 9) SECURITY CLIP : STAINLESS STEEL
- 10) MIN LITS OF STRING WITHOJT TENSION CLAMP : 1280 kN.
- 11) TOTAL MASS OF THE ASSEMBLY : 261.72 kg (APPROX)
- 12) EACH COMPONENT SHALL BE LEGIBLY & INDELIBLY MARKED WITH TRADE MARK OF THE MANUFACTURER - "EMI" EXCLUDING SMALL SUB COMPONENTS VIZ. SPRING WASHERS, SECURITY CLIPS ETC.
- 13) The drawing is indicative and for the tender purpose only.

400 KV. QUADRUPLE TENSION
STRING SUITABLE FOR
QUADRUPLE ACSR MOOSE
CONDUCTOR

19	ANCHOR SHACKLE	FORGED STEEL CL-IV, IS:2004	320 KN.	2.370 KG	2	H. D. G.	OT : AS3
18	SPACER (250 mm)	ALUMINIUM ALLOY 4600,IS:733	----	1.100 KG	1	----	OT : RSP
17	CORONA CONTROL RING	ALUMINIUM ALLOY 63400/6063 IS:733	1.5 KN	15.800 KG	2,SET	----	OT : CCR
16	COMPRESSION DEADEND	ALUMINIUM ALLOY 63400/6063 IS:733	53.2 KN(min)	6.500 KG	4	----	OT : DE
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14	SAG ADJUSTING PLATE	MILD STEEL Fe-410 IS:2062	160 KN	6.900 KG	4	H. D. G.	OT : SAP
13	CLEVIS EYE	FORGED STEEL CL-IV, IS:2004	160 KN	1.250 KG	4	H. D. G.	OT : CE
12	YOKE PLATE	MILD STEEL Fe-410 IS:2062	320 KN.	9.800 KG	2	H. D. G.	OT :YPL1
11	ANCHOR SHACKLE	FORGED STEEL CL-IV, IS:2004	160 KN.	1.250 KG	12	H. D. G.	OT : AS2
10	YOKE PLATE	MILD STEEL Fe-410 IS:2062	320 KN.	9.700 KG	2	H. D. G.	OT : YPL
9	SOCKET CLEVIS	FORGED STEEL CL-IV, IS:2004	160 KN	1.500 KG	4	H. D. G.	OT : SC
8	ARCING HORN	MILD STEEL Fe-410 IS:2062	1.5 KN	2.670 KG	2	H. D. G.	OT : AH
7	BALL CLEVIS	FORGED STEEL CL-IV, IS:2004	160 KN	1.150 KG	4	H. D. G.	OT : BC
6	YOKE PLATE	MILD STEEL Fe-410 IS:2062	320 KN.	10.300 KG	2	H. D. G.	OT : YPT1
5	ANCHOR SHACKLE	FORGED STEEL CL-IV, IS:2004	320 KN.	2.370 KG	2	H. D. G.	OT : AS1
4	YOKE PLATE	MILD STEEL Fe-410 IS:2062	640 KN.	21.300 KG	1	H. D. G.	OT : YPT
3	STRAP	MILD STEEL Fe-410 IS:2062	640 KN.	15.500 KG	1,SET	H. D. G.	OT : SP
2	EXTENSION LINK	MILD STEEL Fe-410 IS:2062	640 KN.	13 KG	1	H. D. G.	OT : EL
1	ANCHOR SHACKLE	FORGED STEEL CL-IV, IS:2004	640 KN.	7 KG	2	H. D. G.	OT : AS
No.	DESCRIPTION	MATERIAL	U.T.S.	WEIGHT	QTY.	FINISH	COMPONENT NO.

TECHNICAL DETAILS:

- 1) ALL DIMENSIONS ARE IN MILLIMETER.
- 2) SLIPPING STRENGTH OF CLAMP : 153.2 kN (Min.).
- 3) BALL & SOCKET SIZE 20 mm AS PER IS:2486. (PART-II).
- 4) ALL FERROUS PARTS HOT DIP GALVANISED & ELECTRO GALVANISED AS PER POWERGRID SPECIFICATION.
- 5) MIN.CORONA EXTINCTION VOLTAGE (DRY) 320 KV (RMS).
- 6) RIV AT 305 KV RMS (DRY) BELOW 1000 MICROVOLTS.
- 7) HARDWARE TOLERANCES ON LENGTH $\pm 2\%$.
- 8) GENERAL TOLERANCE $\pm 3\%$ UNLESS OTHER WISE SPECIFIED.
- 9) SECURITY CLIP : STAINLESS STEEL
- 10) MIN UTS OF STRING WITHOUT TENSION CLAMP : 120 kN
- 11) TOTAL MASS OF THE ASSEMBLY : 95.42 kg (APPROX)
- 12) EACH COMPONENT SHALL BE LEGIBLY & INDELIBLY MARKED WITH TRADE MARK OF THE MANUFACTURER - "EMI" EXCLUDING SMALL SUBCOMPONENTS VIZ. SPRING WASHERS, SECURITY CLIPS ETC.
- 13) The drawing is indicative and for the tender purpose only.

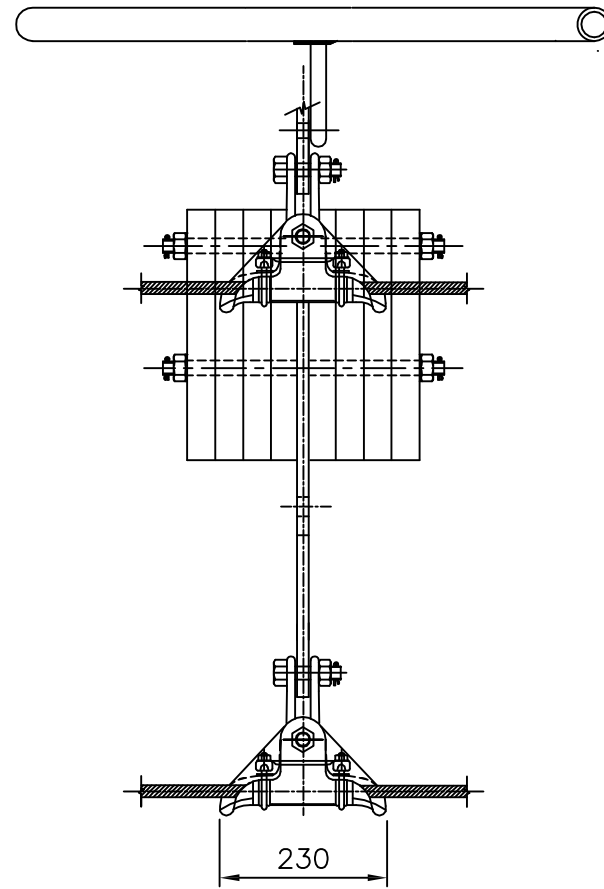
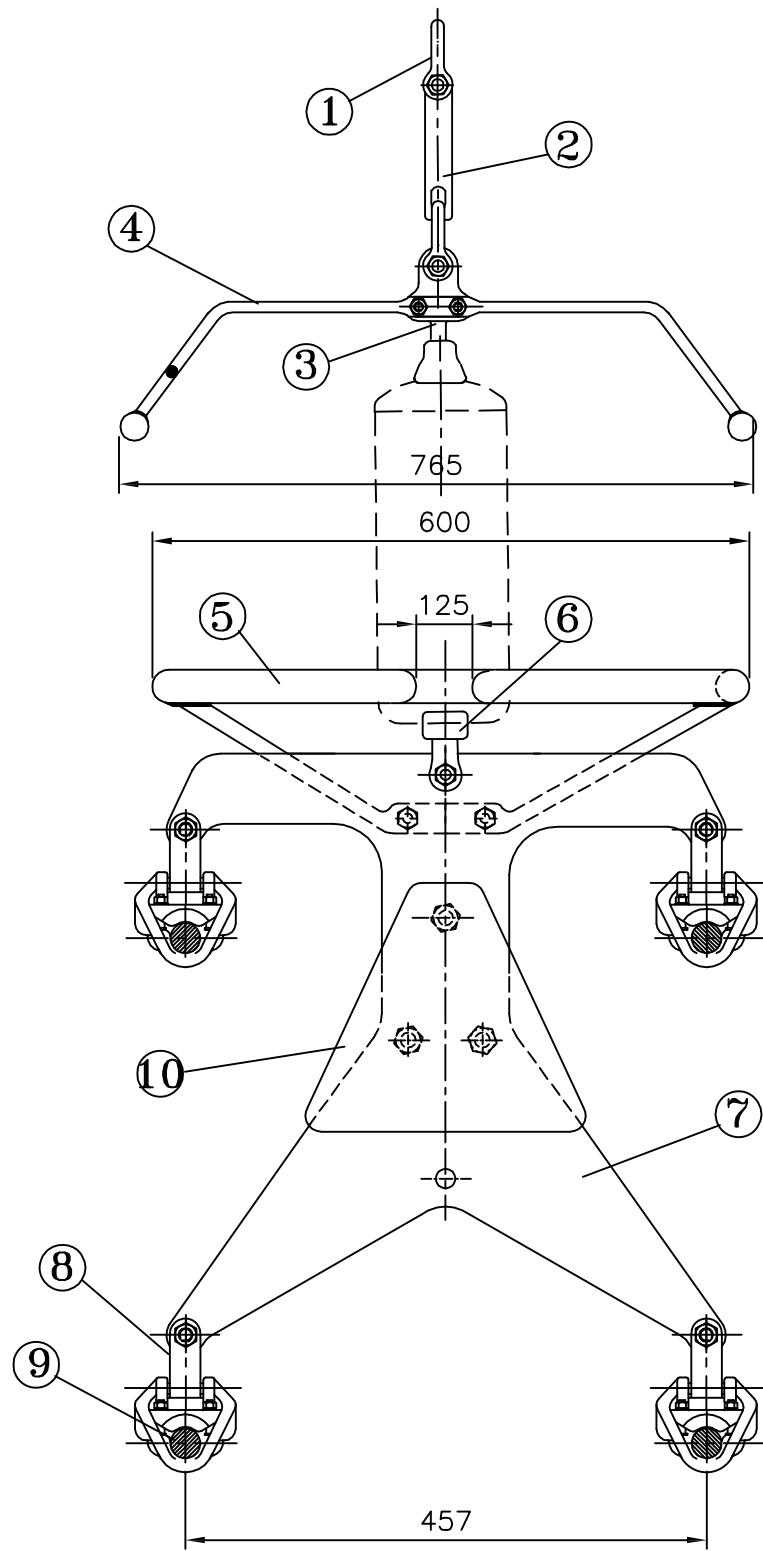


400 KV DOUBLE I SUSPENSION STRING FOR QUADRUPLE ACSR MOOSE CONDUCTOR

14	SPACER (250 mm)	ALUMINIUM ALLOY 4600,IS:617	----	1.100 KG	1	----	ST : RSP
13	COMPRESSION DEADEND	ALUMINIUM ALLOY 63400/6063 IS:733	153.2 KN(min)	6.500 KG	4	----	ST : DE
12	ANCHOR SHACKLE	FORGED STEEL CL-IV, IS:2004	70 KN	1.030 KG	4	H. D. G.	ST : AS2
11	Y-STRAP	MILD STEEL Fe-410, IS:2062	70 KN.	2.200 KG	2	H. D. G.	ST : YS
10	YOKE PLATE	MILD STEEL Fe-410, IS:2062	70 KN.	5.800 KG	2	H. D. G.	ST : YP1
9	ANCHOR SHACKLE	FORGED STEEL CL-IV, IS:2004	70 KN	0.700 KG	4	H. D. G.	ST : AS1
8	YOKE PLATE	MILD STEEL Fe-410, IS:2062	120 KN	6.850 KG	1	H. D. G.	ST : YP
7	SOCKET CLEVIS	FORGED STEEL CL-IV, IS:2004	120 KN	1.350 KG	1	H. D. G.	ST : SC
6	CORONA CONTROL RING	ALUMINIUM ALLOY 63400/6063, IS:733	1.5 KN	7.500 KG	2,SETS	----	ST : CCR
5	ARCING HORN	MILD STEEL Fe-410, IS:2062	1.5 KN	2.000 KG	1	H. D. G.	ST : AH
4	HORN HOLDER BALL EYE	FORGED STEEL CL-IV, IS:2004	120 KN	0.700 KG	1	H. D. G.	ST : HHB
3	EXTENSION LINK	MILD STEEL Fe-410, IS:2062	120 KN	8.200 KG	1	H. D. G.	ST : EL
2	TURN BUCKLE	FORGED STEEL CL-IV, IS:2004	120 KN	4.100 KG	1	H. D. G.	ST : TB
1	ANCHOR SHACKLE	FORGED STEEL CL-IV, IS:2004	120 KN	1.200 KG	6	H. D. G.	ST : AS
Sr.No.	DESCRIPTION	MATERIAL	U.T.S.	WEIGHT	QTY.	FINISH	COMPONENT NO

TECHNICAL DETAILS:

- 1) ALL DIMENSIONS ARE IN MILLIMETER.
- 2) SLIPPING STRENGTH OF CLAMP BETWEEN 20 TO 29 kN.
- 3) BALL & SOCKET SIZE 20 mm AS PER IS:2486. (PART-II).
- 4) ALL FERROUS PARTS ARE HOT DIP GALVANIZED & SPRING WASHER ELECTRO GALVANISED AS PER POWERGRID SPECIFICATION.
- 5) MIN.CORONA EXTINCTION VOLTAGE (DRY) 320 KV (RMS).
- 6) RIV AT 305 KV RMS (DRY) BELOW 1000 MICROVOLTS.
- 7) HARDWARE TOLERANCES ON LENGTH $\pm 2\%$.
- 8) GENERAL TOLERANCE $\pm 3\%$ UNLESS OTHERWISE SPECIFIED.
- 9) MIN UTS OF STRING WITHOUT SUSPENSION CLAMP : 120 kN
- 10) BALANCING WEIGHTS FOR TRANSPOSITION TOWERS ONLY.
- 11) TOTAL MASS OF ASSEMBLY : 248.16 kg (APPROX).
- 12) EACH COMPONENT SHALL BE LEGIBLY & INDELIBLY MARKED WITH TRADE MARK OF THE MANUFACTURER - "EMI" EXCLUDING SMALL SUBCOMPONENTS VIZ. SPRING WASHERS, SECURITY CLIPS ETC.
- 13) The drawing is indicative and for the tender purpose only.

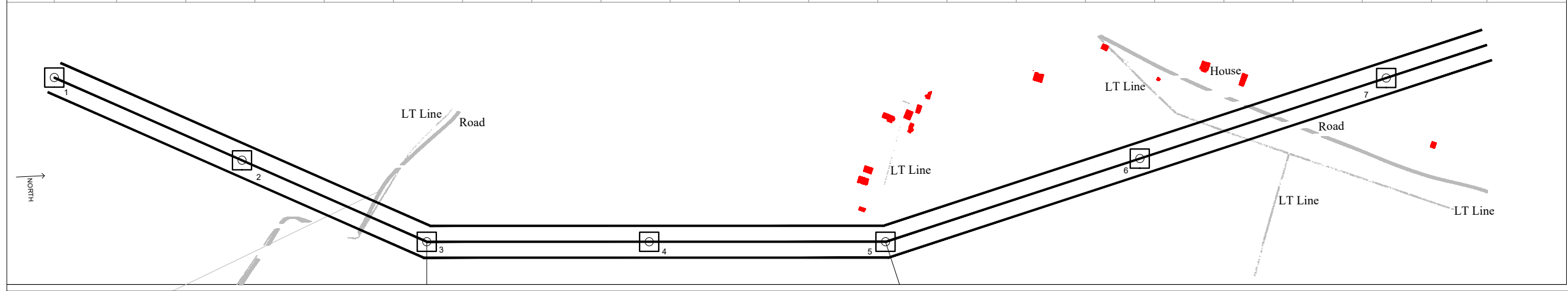
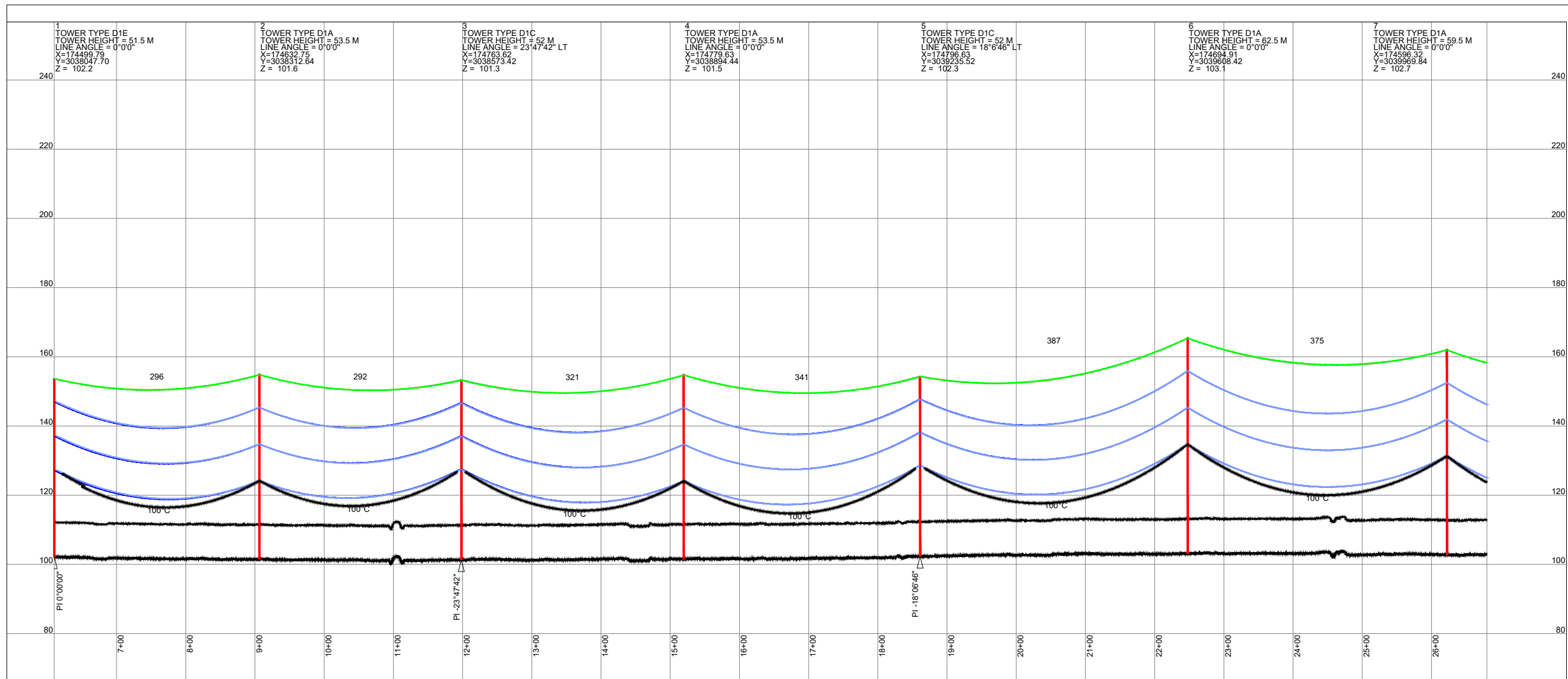


COMPONENT DETAILS

No.	DESCRIPTION	MATERIAL	U.T.S.	WEIGHT	QTY.	FINISH	COMPONENT NO.
10	COUNTER WEIGHT ASSEMBLY	CAST IRON IS : 210	----	203.000 KG	1,SET	H. D. G.	SSP : CW
9	SUSPENSION CLAMP	ALUMINIUM ALLOY 4600, IS:617	70 KN	2.900 KG	4	----	SSP : SCL
8	CLEVIS CONNECTOR	FORGED STEEL CL-IV, IS:2004	70 KN	1.1 KG	4	H. D. G.	SSP : CC
7	YOKE PLATE	MILD STEEL Fe-410 IS:2062	120 KN	17.4 KG	1	H. D. G.	SSP : YP
6	SOCKET CLEVIS	FORGED STEEL CL-IV, IS:2004	120 KN	1.350 KG	1	H. D. G.	SSP : SC
5	GRADING RING	ALUMINIUM ALLOY 63400/6063 ,IS:733	1.5 KN	2.750 KG	1	----	SSP : GR
4	ARCING HORN	MILD STEEL Fe-410 IS:2062	1.5 KN	3.060 KG	1	H. D. G.	SSP : AH
3	HORN HOLDER BALL EYE	FORGED STEEL CL-IV, IS:2004	120 KN	0.700 KG	1	H. D. G.	SSP : HHB
2	EXTENSION LINK	MILD STEEL Fe-410 IS:2062	120 KN	1.900 KG	1	H. D. G.	SSP : EL
1	ANCHOR SHACKLE	FORGED STEEL CL-IV, IS:2004	120 KN	1.200 KG	2	H. D. G.	SSP : AS

400 KV SINGLE I SUSPENSION PILOT STRING SUITABLE FOR QUADRUPLE ACSR MOOSE CONDUCTOR

B Plan and Profile for 18km Transmission Line



LEGEND

Foot Trail		Angle Point		Cliff, Boulder	
Road With Bridge/ Culvert		Tap		Tree, Bamboo, Banana	
River, Stream, Bank		Suspension Bridge		Proposed TL Center Line	
Kulo, Canal, Pond		Fence		ROW of Proposed Center Line	
House / Shed		Electric Pole, 132 kV TL Tower		Major Contour	
Cultivation / Forest Boundary		TL Crossing		Minor Contour	

SCALE

H=1:2000 V=1:400

REV. NO.	DATE	PREPARED BY	CHECKED BY	APPROVED BY	REMARKS

Project :

Consulting Services for Detailed Survey and updated Line Design for 30 km of Changes in 400kV Transmission Line Route Alignment

Subject :

Plan and Profile of Transmission Line Alignment
India Border-New Butwal 400kV TL

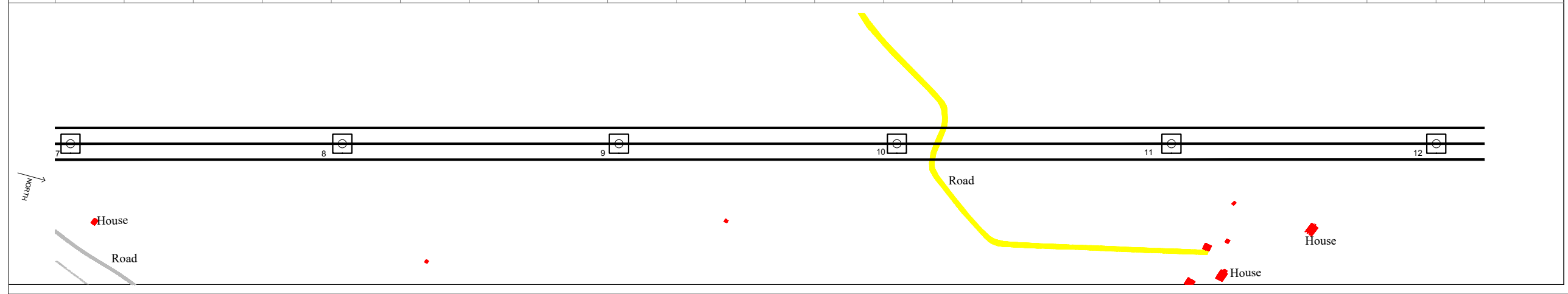
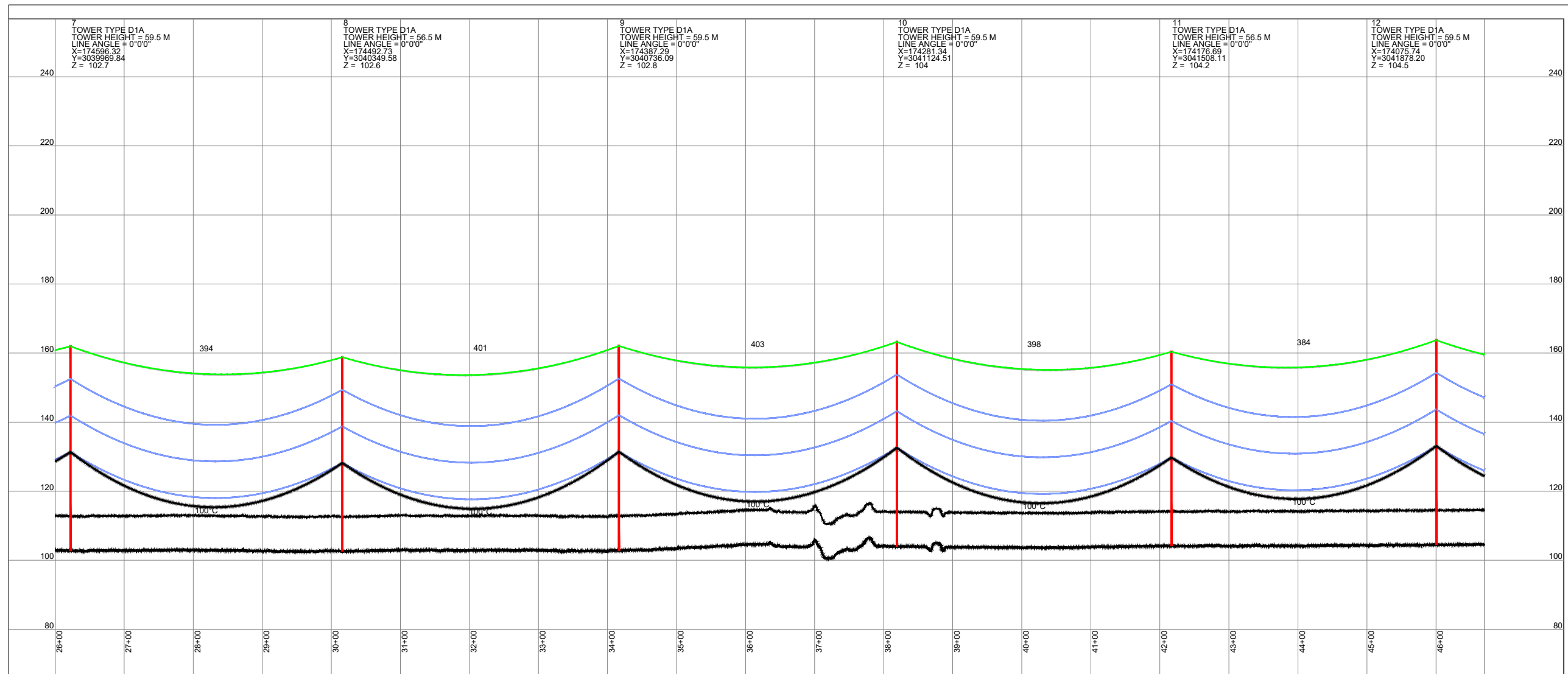
Client :

Millennium Challenge Account Nepal (MCA-Nepal)

Consultant: June, 2023

POWER GRID CORPORATION OF INDIA LIMITED AND JADE CONSULT P. LTD, NEPAL AS SUB-CONSULTANT

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Size A3



LEGEND

Foot Trail		Angle Point		Cliff, Boulder	
Road With Bridge/ Culvert		Tap		Tree, Bamboo, Banana	
River, Stream, Bank		Suspension Bridge		Proposed TL Center Line	
Kulo, Canal, Pond		Fence		ROW of Proposed Center Line	
House / Shed		Electric Pole, 132 kV TL Tower		Major Contour	
Cultivation / Forest Boundary		TL Crossing		Minor Contour	

SCALE

H=1:2000 V=1:400

REV.NO.	DATE	PREPARED BY	CHECKED BY	APPROVED BY	REMARKS

Project :

Consulting Services for Detailed Survey and updated Line Design for 30 km of Changes in 400kV Transmission Line Route Alignment

Subject :

Plan and Profile of Transmission Line Alignment India Border-New Butwal 400kV TL

Client :

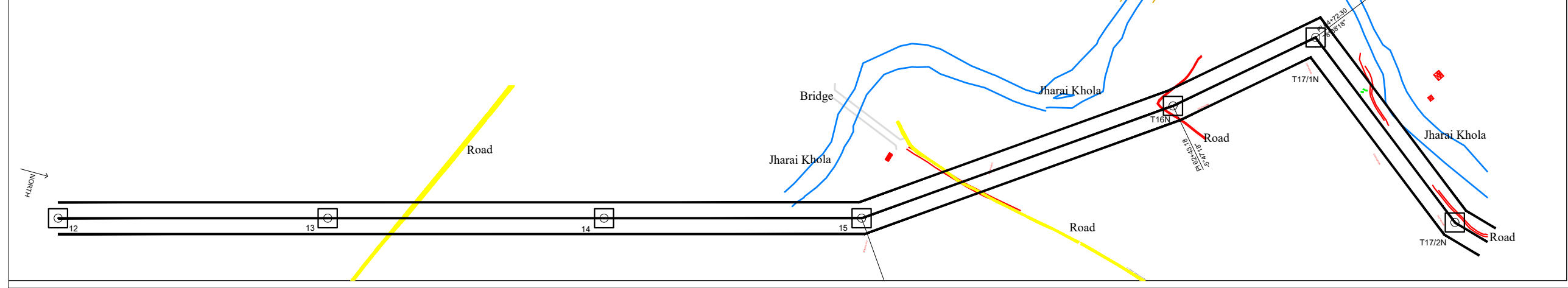
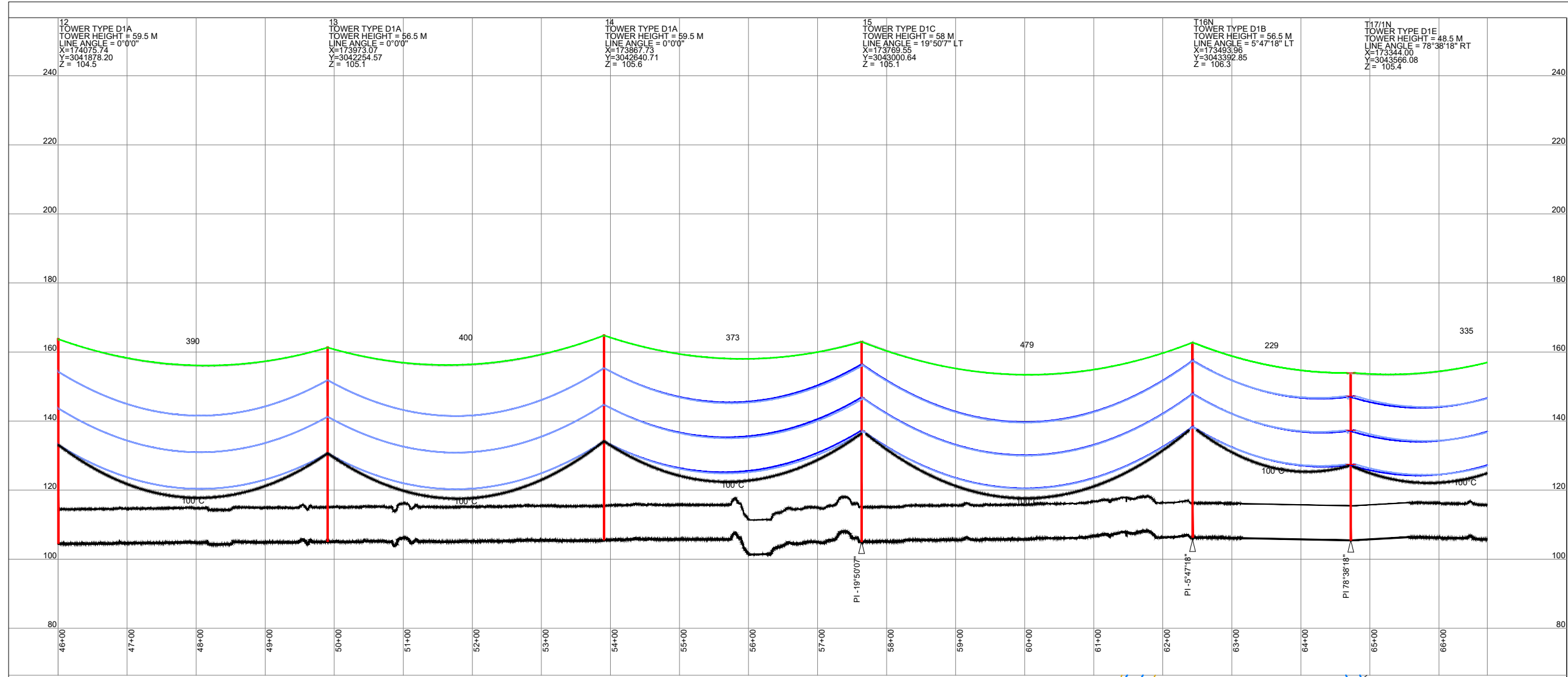
Millennium Challenge Account Nepal (MCA-Nepal)

Consultant: June, 2023

POWER GRID CORPORATION OF INDIA LIMITED AND JADE CONSULT P. LTD, NEPAL AS SUB-CONSULTANT



Sheet no. 2 Size A3



LEGEND

Foot Trail		Angle Point		Cliff, Boulder	
Road With Bridge/ Culvert		Tap		Tree, Bamboo, Banana	
River, Stream, Bank		Suspension Bridge		Proposed TL Center Line	
Kulo, Canal, Pond		Fence		ROW of Proposed Center Line	
House / Shed		Electric Pole, 132 kV TL Tower		Major Contour	
Cultivation / Forest Boundary		TL Crossing		Minor Contour	

SCALE

H=1:2000 V=1:400

REV.NO.	DATE	PREPARED BY	CHECKED BY	APPROVED BY	REMARKS

Project : Consulting Services for Detailed Survey and updated Line Design for 30 km of Changes in 400kV Transmission Line Route Alignment

Subject : **Plan and Profile of Transmission Line Alignment**
India Border-New Butwal 400kV TL

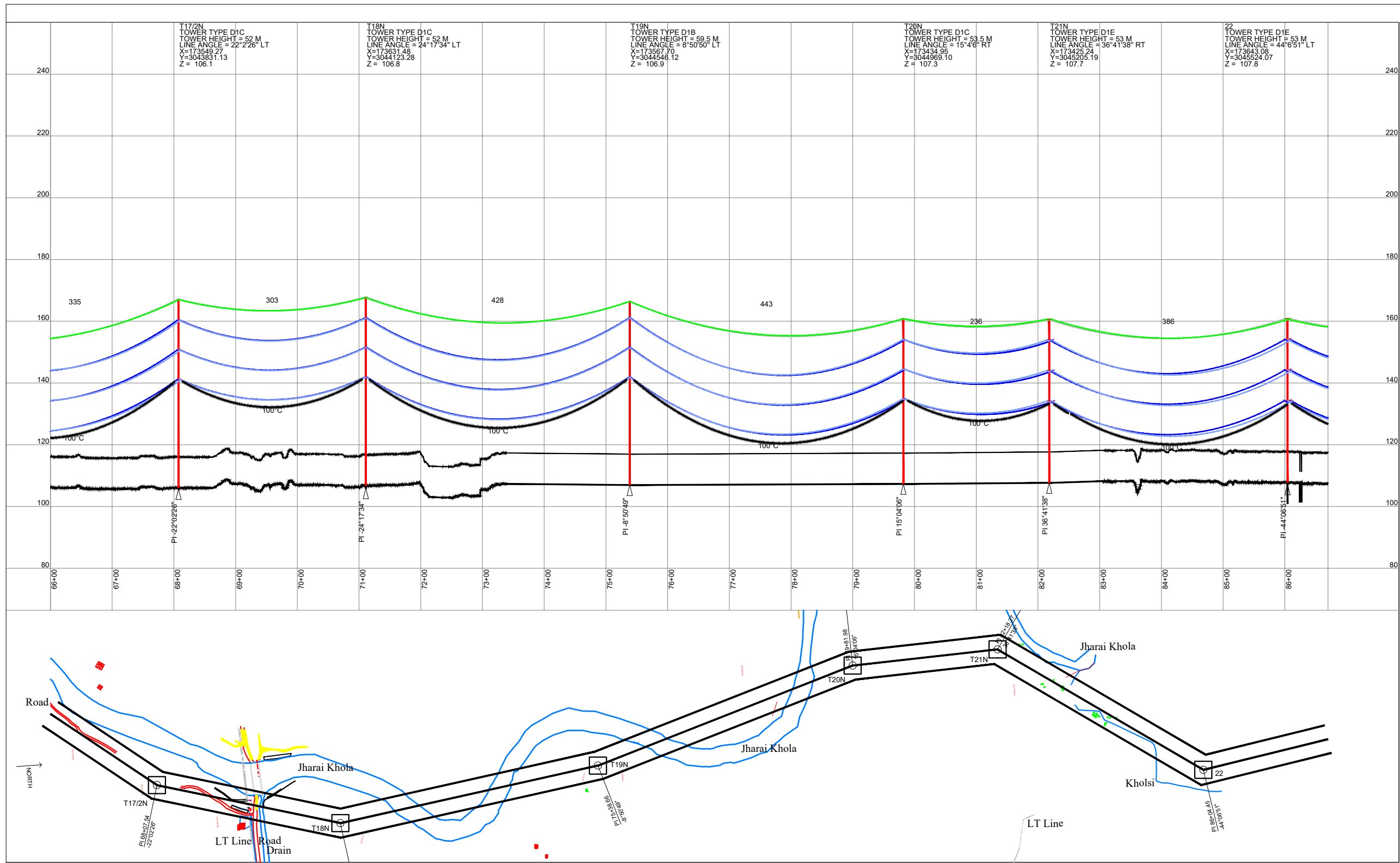
Client : Millennium Challenge Account Nepal (MCA-Nepal)

Consultant: POWER GRID CORPORATION OF INDIA LIMITED AND JADE CONSULT P. LTD, NEPAL AS SUB-CONSULTANT

June, 2023

Sheet no. 3

Size A3

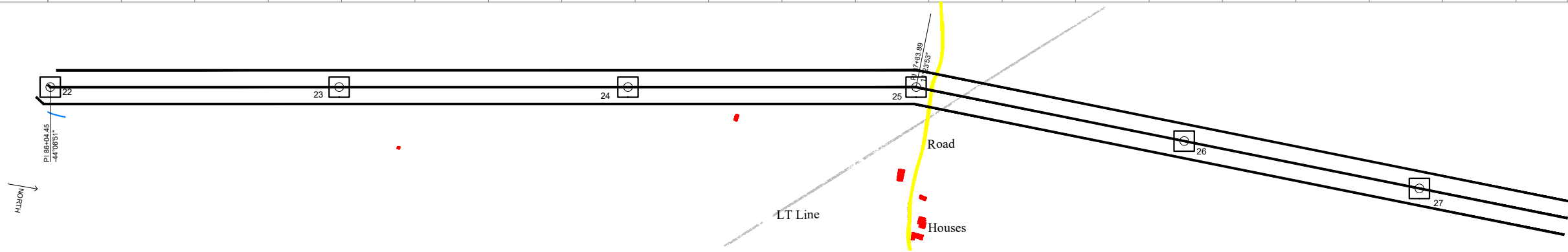
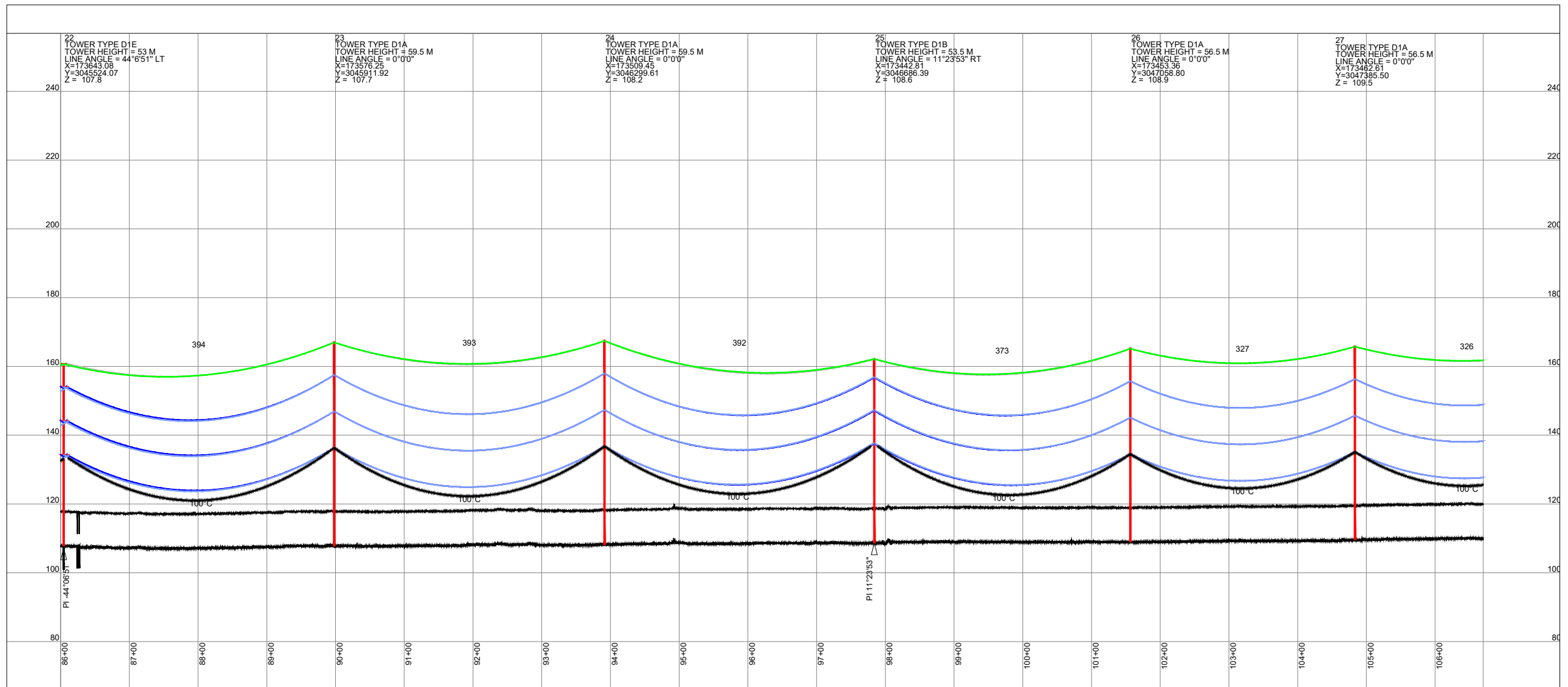


LEGEND			
Foot Trail		Angle Point	
Road With Bridge/ Culvert		Tap	
River, Stream, Bank		Suspension Bridge	
Kulo, Canal, Pond		Fence	
House / Shed		Electric Pole, 132 kV TL Tower	
Cultivation / Forest Boundary		TL Crossing	
		Cliff, Boulder	
		Tree, Bamboo, Banana	
		Proposed TL Center Line	
		ROW of Proposed Center Line	
		Major Contour	
		Minor Contour	

SCALE					
H=1:2000			V=1:400		
REV.NO.	DATE	PREPARED BY	CHECKED BY	APPROVED BY	REMARKS

Project :	Consulting Services for Detailed Survey and updated Line Design for 30 km of Changes in 400kV Transmission Line Route Alignment
Subject :	Plan and Profile of Transmission Line Alignment India Border-New Butwal 400kV TL

Client :		Millennium Challenge Account Nepal (MCA-Nepal)	
Consultant:	June, 2023	Sheet no. 4	Size A3
POWER GRID CORPORATION OF INDIA LIMITED AND JADE CONSULT P. LTD, NEPAL AS SUB-CONSULTANT			



LEGEND

Foot Trail		Angle Point		Cliff, Boulder	
Road With Bridge/ Culvert		Tap		Tree, Bamboo, Banana	
River, Stream, Bank		Suspension Bridge		Proposed TL Center Line	
Kulo, Canal, Pond		Fence		ROW of Proposed Center Line	
House / Shed		Electric Pole, 132 kV TL Tower		Major Contour	
Cultivation / Forest Boundary		TL Crossing		Minor Contour	

SCALE

H=1:2000 V=1:400

REV. NO.	DATE	PREPARED BY	CHECKED BY	APPROVED BY	REMARKS

Project :

Consulting Services for Detailed Survey and updated Line Design for 30 km of Changes in 400kV Transmission Line Route Alignment

Subject :

Plan and Profile of Transmission Line Alignment
India Border-New Butwal 400kV TL

Client :

Millennium Challenge Account Nepal (MCA-Nepal)



Consultant:

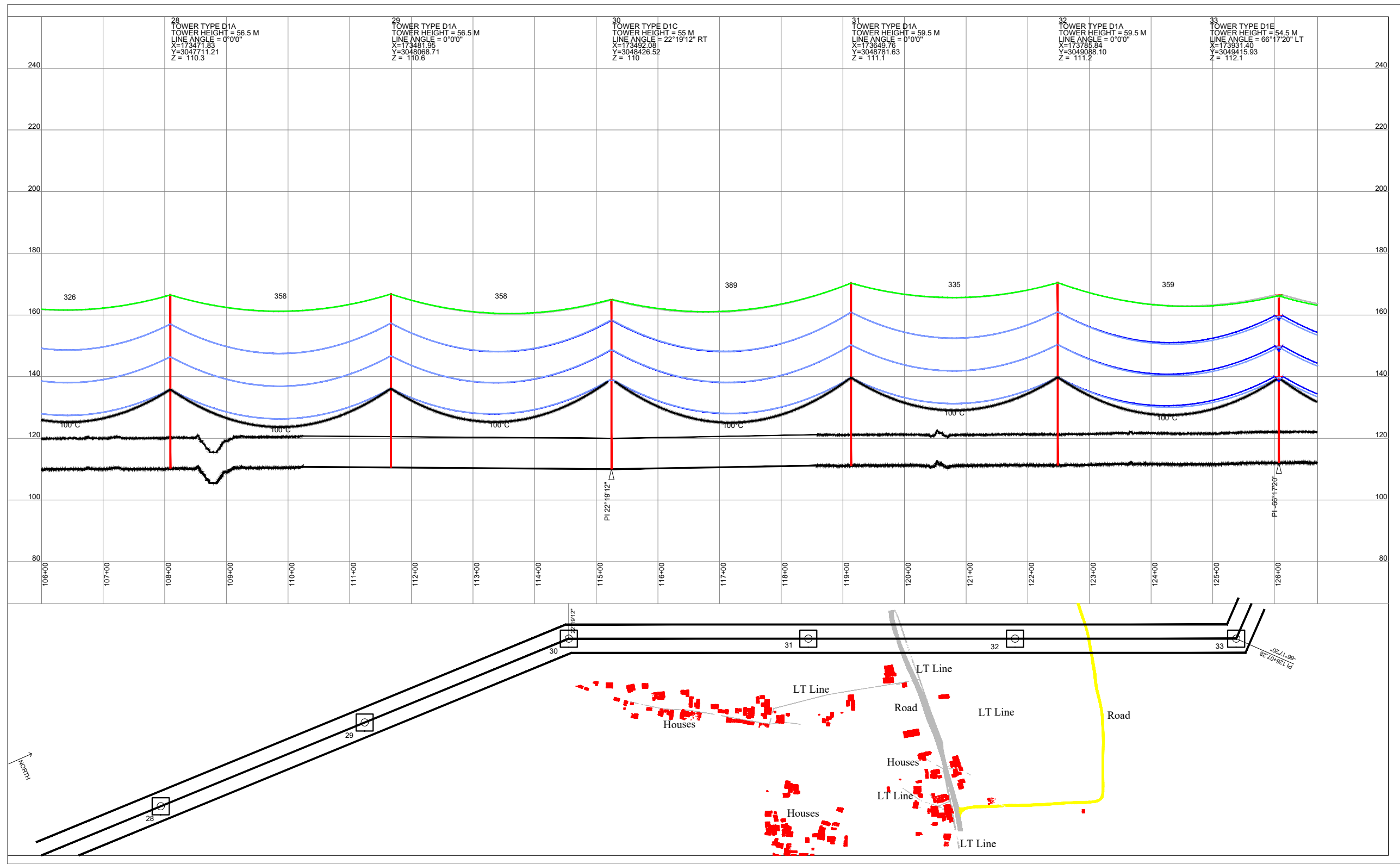
June, 2023

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AND
JADE CONSULT P. LTD, NEPAL
AS SUB-CONSULTANT

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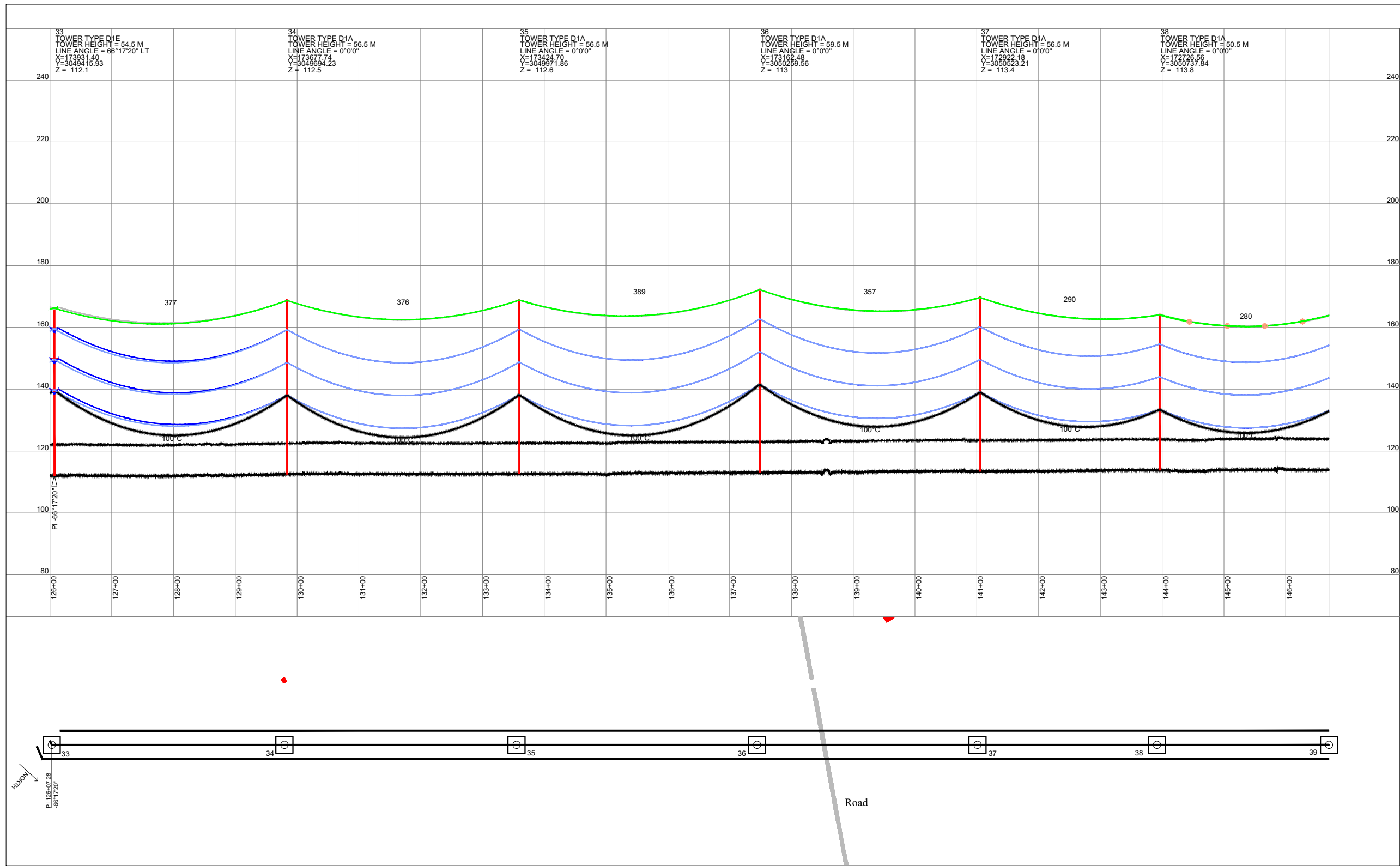


LEGEND	
Foot Trail	Angle Point
Road With Bridge/ Culvert	Tap
River, Stream, Bank	Suspension Bridge
Kulo, Canal, Pond	Fence
House / Shed	Electric Pole, 132 kV TL Tower
Cultivation / Forest Boundary	TL Crossing
Cliff, Boulder	Tree, Bamboo, Banana
Proposed TL Center Line	ROW of Proposed Center Line
Major Contour	Minor Contour

SCALE					
H=1:2000	V=1:400				
REV. NO.	DATE	PREPARED BY	CHECKED BY	APPROVED BY	REMARKS

Project :	Consulting Services for Detailed Survey and updated Line Design for 30 km of Changes in 400kV Transmission Line Route Alignment
Subject :	Plan and Profile of Transmission Line Alignment India Border-New Butwal 400kV TL

Client :	
Millennium Challenge Account Nepal (MCA-Nepal)	
Consultant:	June, 2023
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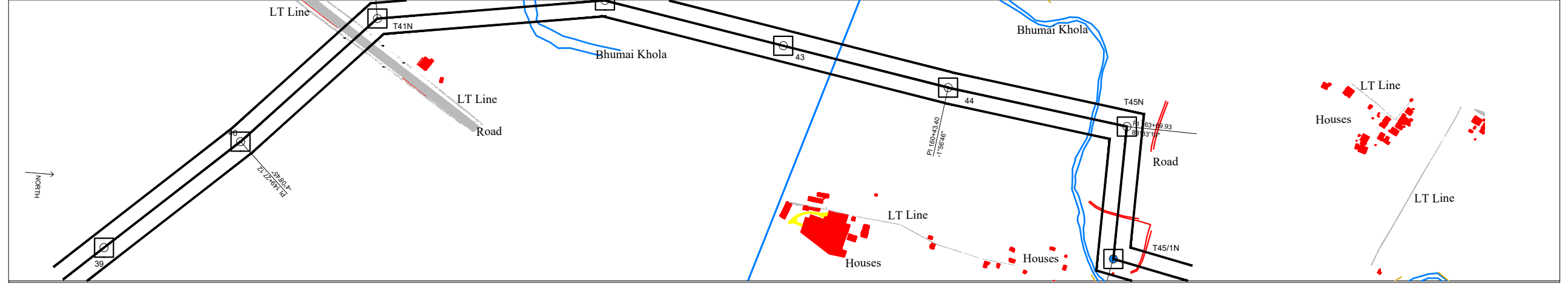
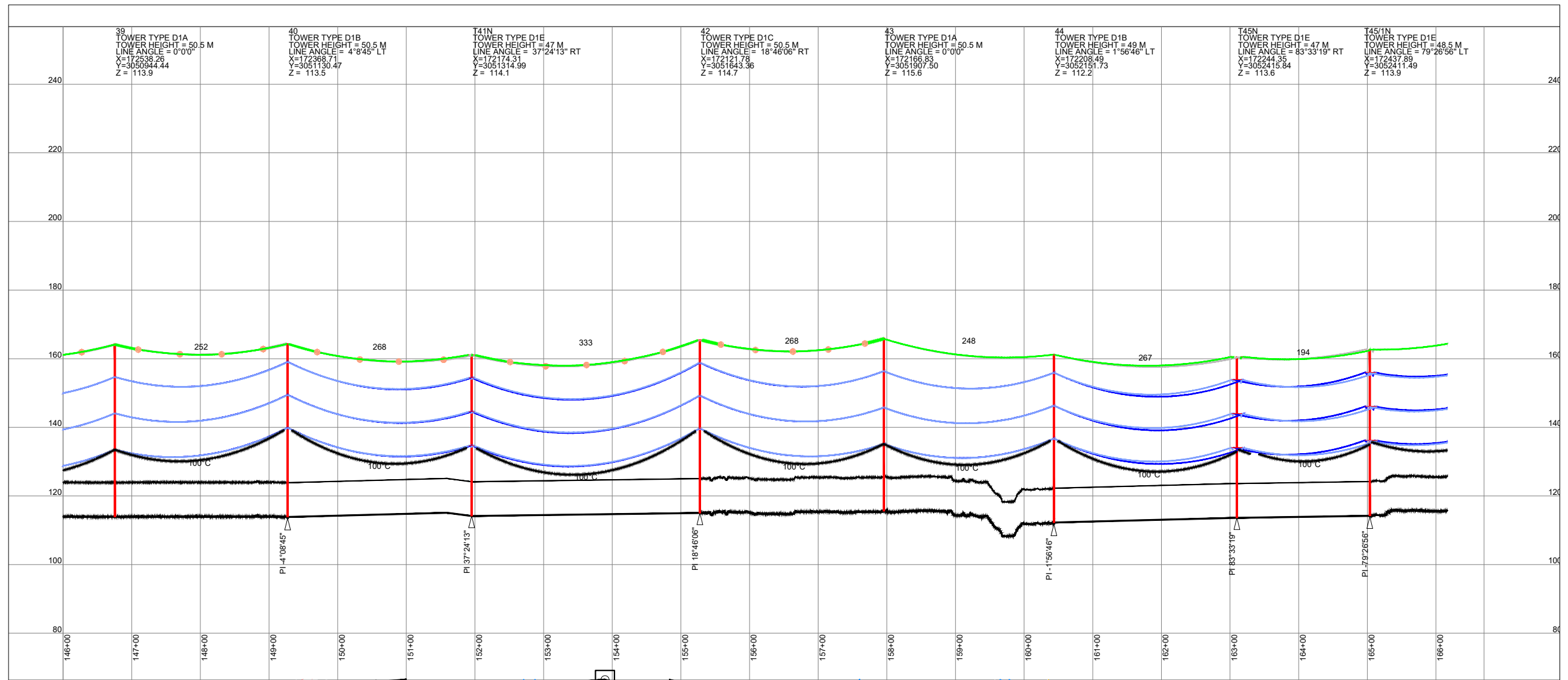


LEGEND	
Foot Trail	
Road With Bridge/ Culvert	
River, Stream, Bank	
Kulo, Canal, Pond	
House / Shed	
Cultivation / Forest Boundary	
Angle Point	
Tap	
Suspension Bridge	
Fence	
Electric Pole, 132 kV TL Tower	
TL Crossing	
Cliff, Boulder	
Tree, Bamboo, Banana	
Proposed TL Center Line	
ROW of Proposed Center Line	
Major Contour	
Minor Contour	

SCALE					
H=1:2000	V=1:400				
REV.NO.	DATE	PREPARED BY	CHECKED BY	APPROVED BY	REMARKS

Project :	Consulting Services for Detailed Survey and updated Line Design for 30 km of Changes in 400kV Transmission Line Route Alignment
Subject :	Plan and Profile of Transmission Line Alignment India Border-New Butwal 400KV TL

Client :	
Millennium Challenge Account Nepal (MCA-Nepal)	
Consultant:	June, 2023
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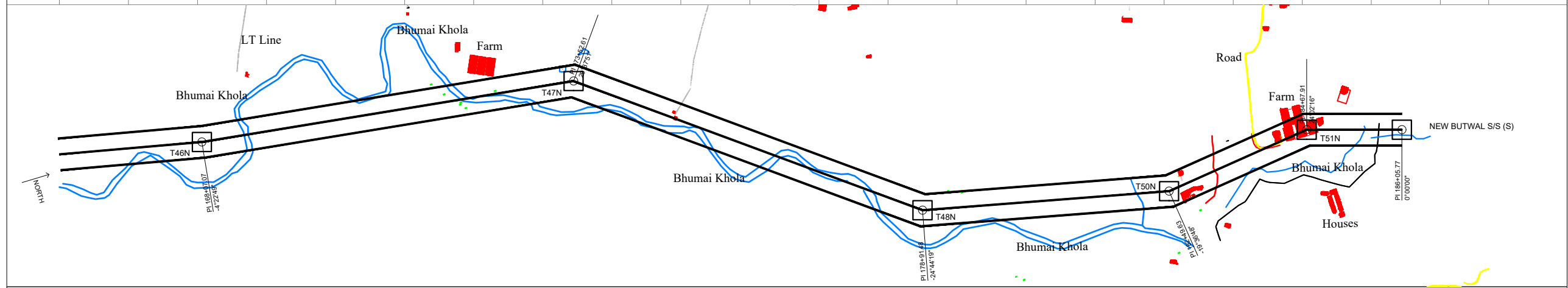
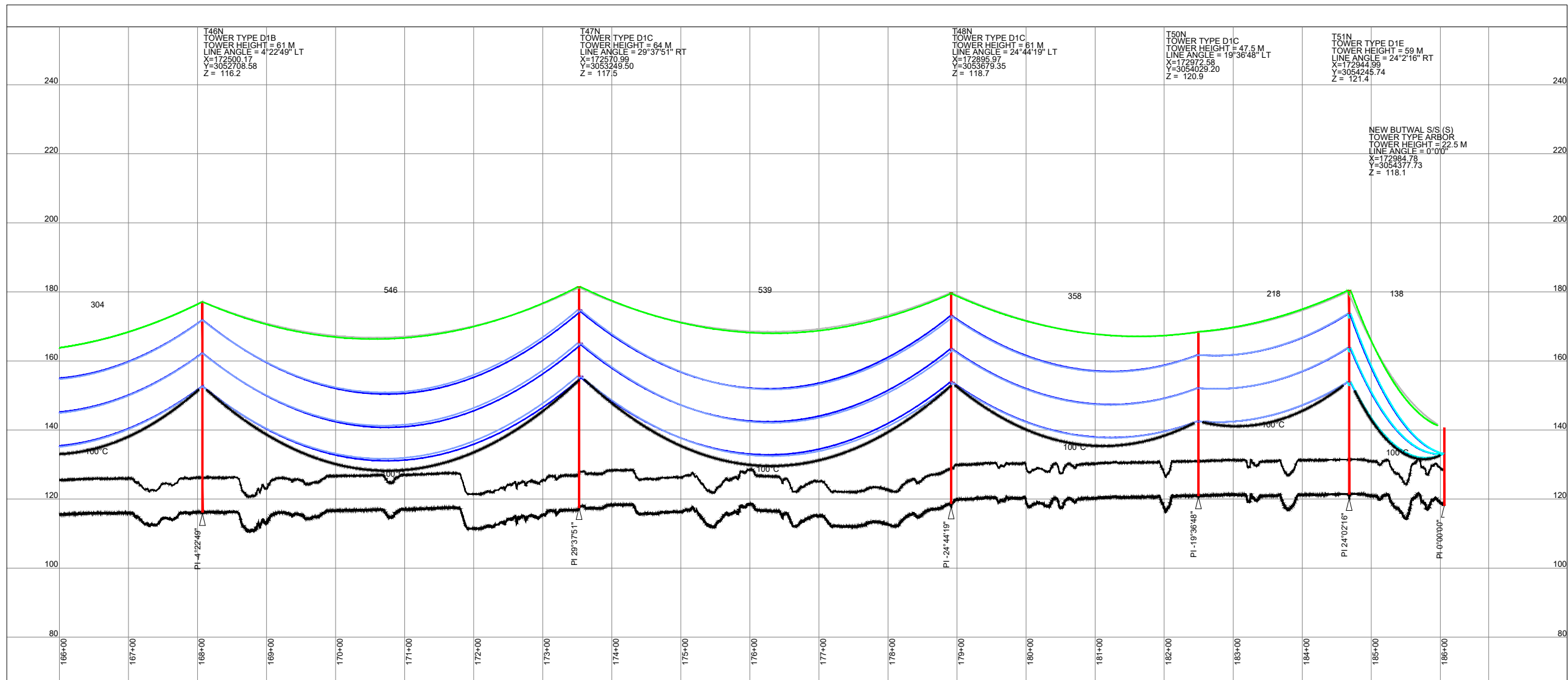


LEGEND			
Foot Trail	Angle Point	Cliff, Boulder	
Road With Bridge/ Culvert	Tap	Tree, Bamboo, Banana	
River, Stream, Bank	Suspension Bridge	Proposed TL Center Line	
Kulo, Canal, Pond	Fence	ROW of Proposed Center Line	
House / Shed	Electric Pole, 132 kV TL Tower	Major Contour	
Cultivation / Forest Boundary	TL Crossing	Minor Contour	

SCALE					
H=1:2000		V=1:400			
REV.NO.	DATE	PREPARED BY	CHECKED BY	APPROVED BY	REMARKS

Project :	Client :
Consulting Services for Detailed Survey and updated Line Design for 30 km of Changes in 400kV Transmission Line Route Alignment	Millennium Challenge Account Nepal (MCA-Nepal)
Subject :	Consultant:
Plan and Profile of Transmission Line Alignment India Border-New Butwal 400kV TL	June, 2023
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POWER GRID CORPORATION OF INDIA LIMITED
AND
JADE CONSULT P. LTD, NEPAL AS SUB-CONSULTANT



LEGEND	
Foot Trail	Angle Point
Road With Bridge/ Culvert	Tap
River, Stream, Bank	Suspension Bridge
Kulo, Canal, Pond	Fence
House / Shed	Electric Pole, 132 kV TL Tower
Cultivation / Forest Boundary	TL Crossing
Cliff, Boulder	Tree, Bamboo, Banana
Proposed TL Center Line	ROW of Proposed Center Line
Major Contour	Minor Contour

SCALE					
H=1:2000	V=1:400				
REV. NO.	DATE	PREPARED BY	CHECKED BY	APPROVED BY	REMARKS

Project :	Consulting Services for Detailed Survey and updated Line Design for 30 km of Changes in 400kV Transmission Line Route Alignment
Subject :	Plan and Profile of Transmission Line Alignment India Border-New Butwal 400kV TL

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Millennium Challenge Account Nepal (MCA-Nepal)	
Consultant:	June, 2023
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